534880-2-1-TM

DATATAPE®

12-447C, 12-447C-1 DIRECT REPRODUCE AMPLIFIERS

TECHNICAL MANUAL

BELL & HOWELL
DATATAPE DIVISION
300 SIERRA MADRE VILLA, PASADENA, CA 91109

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SECTION I

GENERAL DESCRIPTION

1-1. GENERAL.

1-2. This manual describes the 12-447C Direct Reproduce Amplifier. The 12-447C Direct Reproduce Amplifier has a bandwidth of 400 Hz to 1 MHz at 60 inches per second. The direct reproduce amplifier provides a usable signal when reproducing data recorded with the direct method of instrumentation magnetic tape recording.

1-3. In addition to amplifying the low level input from the reproduce head preamplifier, the reproduce amplifier provides amplitude-versus-frequency equalization and compensation to ensure linear phase response. Different amplitude equalization and phase compensation networks are automatically selected for each tape speed. A view of the direct reproduce amplifier is shown in figure 1-1.

1-4. EQUIPMENT DESCRIPTION.

1-5. The direct reproduce amplifier illustrated in figure 1-1 is constructed on a printed circuit board similar to the other record and reproduce amplifiers used in this record/reproduce system. One circuit board is used per channel. Each circuit board plugs into a connector in the amplifier case assembly and is positioned by guide slots. Operating power is furnished when the circuit board is installed in the amplifier case assembly. The components are mounted on one side of a double-sided printed circuit board. A shield, to minimize RF interference and coupling between amplifiers, is mounted on the back side of the circuit board. The dimensions of the direct reproduce amplifier are 4-19/32 inches high by 7-3/8 inches deep by 29/32 inches wide.

1-6. The output signal is normally through a BNC connector on the front panel. The controls most commonly used for calibration adjustments are accessible from the front panel of the circuit board.

1-7. PERFORMANCE CHARACTERISTICS.

1-8. Typical performance characteristics for the reproduce amplifier are given in table 1-1.

ITEM	TYPICAL PERFORMANCE
Frequency Response	400 Hz to 1 MHz at 60 ips.
Input Source	Reproduce head preamplifier.
Output Level	0 to 4 volts peak-to-peak into 600 ohm load, single ended.
Output Impedance	75 ohms nominal.
Power	±15 volts, 100 mA.

Table 1-1. Typical Performance Characteristics, 12-447C Direct Reproduce Amplifier

SECTION II

INSTALLATION

2-1. GENERAL.

2-2. When the 4020 system is installed on an initial installation, the direct reproduce amplifiers are installed when the installation procedures as described in Section II of the system manual have been completed.

2-3. When replacing a direct reproduce amplifier, follow the installation procedures in Section II of the system manual; it will also be necessary to perform the calibration procedures described in the Calibration and Maintenance Section (Section V) of the system manual for the direct record/reproduce electronics.

SECTION III

OPERATION

3-1. GENERAL.

3-2. The direct reproduce amplifier is fully operational when power is turned on. Refer to Section III of the system manual for the operational procedures of the direct reproduce amplifier, as the direct reproduce amplifier must be used in conjunction with a direct record amplifier.

SECTION IV

THEORY OF OPERATION

4-1. GENERAL.

4-2. The direct reproduce amplifier receives the signal from the reproduce head and preamplifier and provides amplification and amplitude-versus-frequency equalization. Amplitude equalization is necessary to compensate for the non-uniform output from the reproduce head due to flux rate of change and high frequency losses. Figure 4-1 illustrates a typical reproduce head response, along with the required complementary reproduce amplifier response to ensure a uniform output at all frequencies within the passband. The equalization is automatically switched at each tape speed to optimize the system response for each bandwidth. Controls are provided to allow exactly the required amount of equalization, despite any variations between tracks.

4-3. In addition to amplitude equalization, additional compensation is included to ensure linear phase response. The phase compensation networks are also automatically switched by the speed select circuitry.

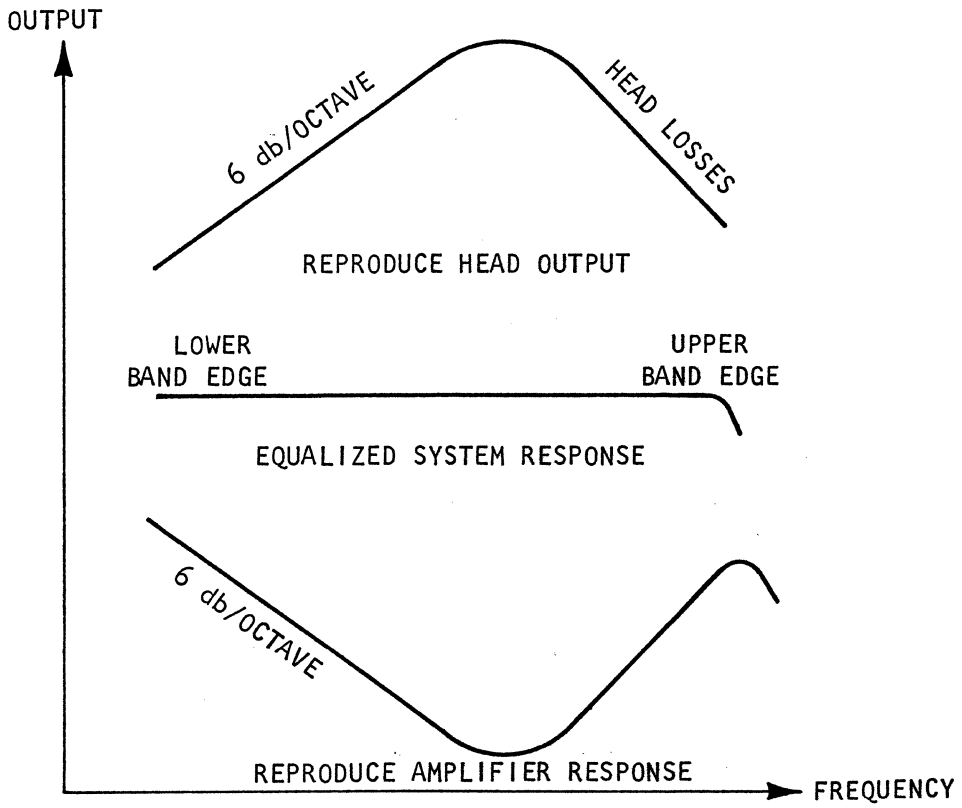


Figure 4-1. Reproduce Head and Amplifier Response Curves

4-4. Figure 4-2 is a block diagram of the direct reproduce amplifier, and figure 7-1 is the schematic diagram of the direct reproduce amplifier.

4-5. CIRCUIT DESCRIPTION.

4-6. INPUT AMPLIFIER. The differential input is applied to pins A and 2 of the reproduce amplifier and is coupled to the base of transistors Q1 and Q2. The 4 MHz bias is stripped from the signal in the input amplifier section. The operation of Q1 and Q2 is as a differential amplifier referenced to ground for better common mode rejection. The network consisting of inductor L1, capacitors C7 and C8, and resistors R11 and R12 between the emitters of transistors Q1 and Q2 is resonant at the bias frequency, and therefore the signal to the base of transistor Q4 is minus the bias due to the notching action of the circuit.

4-7. LOW FREQUENCY AMPLIFIER. The data signal is applied to the inverting input of operational amplifier U2 (pin 8) through coupling capacitor C10. Resistor R37 and capacitor C18 cause the amplifier response to roll off at a 6 dB per octave rate beginning at the lower band edge frequency. The output of U2 (pin 13) is fed through resistor R44 to the emitter of transistor Q13 to be summed with the mid and high frequency equalized signals.

4-8. EQUALIZATION AMPLIFIER. The equalization amplifier consists of transistors Q5, Q6, and Q7 and provides gain equalization through the range of tape speeds. Q5 and Q6 form a differential amplifier followed by Q7, an emitter-follower. The data signal is applied to the base of transistor Q5, while the base of transistor Q6 is controlled by a variable impedance, but constant voltage feedback loop. The level at the base of transistor Q6 will be proportional to the input signal level. The speed select lines select one of the transistors in U1 which places its collector impedance in the feedback network. In addition, the emitter of transistor Q8 provides a feedback voltage through resistors R33 and R27 to the base of transistor Q6. The voltage on the emitter of transistor Q8 will remain constant even though potentiometer R36 or R43 will be switched into the circuit. The change of impedance will be felt at the collector of transistor Q8, and this changing collector current drives the appropriate high frequency equalization network. The high frequency equalized signal is applied to the base of emitter-follower Q14. The signal on the emitter of Q14 is applied to the emitter of transistor Q13 along with the signal from the low frequency amplifier.

4-9. MID FREQUENCY COMPENSATION. Field effect transistors Q10 and Q12 provide the mid frequency equalization. For the three lowest speeds, Q10 is biased on and for the four highest speeds, Q12 is biased on, placing resistors R40 and R46, respectively, into the base circuit of transistor Q13. Transistor Q13 sums the low, mid, and high frequency equalized signals, and this equalized output may be monitored at test point TP5.

4-10. OUTPUT AMPLIFIER. The output amplifier provides phase equalization as well as amplification. The frequency equalized signal at the collector of transistor Q13 is coupled through capacitor C23 to the base of transistor Q15. Emitter-follower Q15 drives the base of transistor Q16 which forms one half of a differential amplifier.

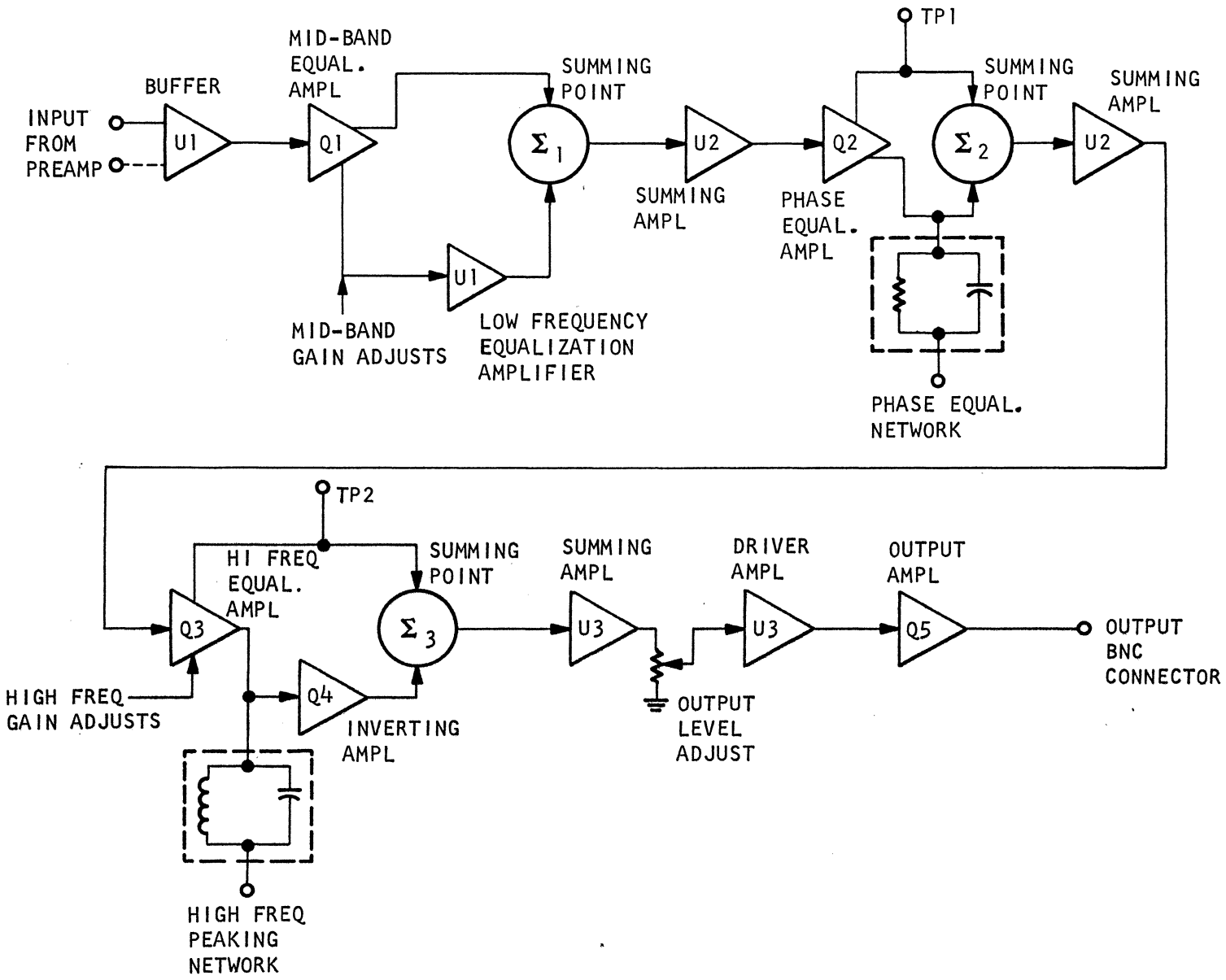


Figure 4-2. Block Diagram, 12-447C Direct Reproduce Amplifier

4-11. Phase equalization is applied to the signal at the differential amplifier with the appropriate transistor of U4 selecting the desired capacitance for equalization. The collector of transistor Q16 is direct coupled to the base of transistor Q17, which acts as a constant current generator for the output amplifier. The differential amplifier output is applied through resistor R70 to the base of transistor Q19, which drives the complementary emitter-follower output transistors. The output is taken from the junction between resistors R77 and R78. Feedback from the junction between resistors R77 and R78 through resistors R75, R61, and R60 along with the phase equalization network is applied to the differential amplifier.

SECTION V

CALIBRATION AND MAINTENANCE

5-1. GENERAL.

5-2. This section of the 12-447C Direct Reproduce Amplifier manual consists of preventive maintenance, and troubleshooting and corrective maintenance. The calibration procedures for the 12-447C Direct Reproduce Amplifier can be found in Section V of the system manual.

5-3. PREVENTIVE MAINTENANCE.

5-4. Preventive maintenance consists of general cleaning and periodic inspection. Accumulation of dust, dirt, grit, and/or grease on the circuit boards is harmful and should be guarded against by periodic inspection and cleaning. Every three months, under normal laboratory conditions, inspect the units for signs of deterioration, loose connections, insecurity of mounting, and foreign matter. The period of cleaning depends on the particular operating environment and should be determined by inspection. As necessary, clean the circuit board with a soft brush, low air pressure, or suitable solvent, being careful not to damage the printed circuitry.

5-5. TROUBLESHOOTING AND CORRECTIVE MAINTENANCE.

5-6. Before attempting repair of a unit suspected of malfunctioning, verify that the symptom is not caused by malfunction of associated equipment such as the power supply, the amplifier case assembly, intercabling errors, etc. This can be done by substituting a known good unit for the suspected unit, or making continuity checks from unit to unit. If such a check eliminates the associated equipment as a source of trouble, check the adjustments which are detailed in Section V of the system manual.

5-7. Once the existence of a defective unit has been established, check it for obviously damaged components, such as burned resistors, or incorrect seating of components. The next step is to verify that the proper supply voltage is reaching the unit. If the supply voltage is correct, the faulty stage within the unit can be located by tracing the signals from stage to stage.

5-8. To aid in identification of a defective stage, apply a 1 kHz signal of normal record level to the input of the record amplifier. Put the system in the run record mode. By following the schematic diagram, figure 7-1, an oscilloscope and an extender card, part number 379634, may be employed to trace the signal through the circuit until the defective component is isolated.

5-9. Once the defective stage has been located, the defective components in that stage can be determined by reference to the schematic diagram, and by making continuity, voltage, and/or resistance measurements about the suspected components.

5-10. REPAIR.

5-11. Repair of the unit should be attempted only by personnel experienced in printed wiring techniques. Recommended repair is limited to the replacement of defective parts and adjustment of controls. When removing and replacing defective parts, care should be exercised so as not to damage the surrounding components or the circuit board. Replacement parts must be of the correct type and value, as listed in the parts list in Section VI. When installing a new part, place it in the exact position of the replaced part. After replacement, carefully inspect the circuit board for evidence of cold solder joints, solder splashes, and insecurity of mounting. If the equipment is repaired, the amplifiers should be checked and, if necessary, adjusted as described in the adjustment procedures in Section V of the system manual.

5-12. PARTS IDENTIFICATION. Components of the direct reproduce amplifier are illustrated in Section VI of this manual, showing locations and part designations. The parts list in Section VI itemizes the component parts in the assembly and provides a Bell & Howell part number for each.

5-13. FIELD REPAIR SERVICE.

5-14. Refer to Section V of the system manual for field repair service information.

5-15. FACTORY REPAIR SERVICE.

5-16. Refer to Section V of the system manual for factory repair service information.

SECTION VI

PARTS LIST

6-1. GENERAL.

6-2. Appropriate parts lists and illustrations for the 12-447C and 12-447C-1 Direct Reproduce Amplifiers, Bell & Howell part numbers 479553 and 534880-0002, covered by this manual follow the instructions given below. The parts lists (tables 6-1 and 6-2) include Bell & Howell DATATAPE Division part number, description, figure and index and/or schematic reference symbol, and where applicable, the manufacturer's or military part number for each component.

6-3. MANUFACTURER'S CODES.

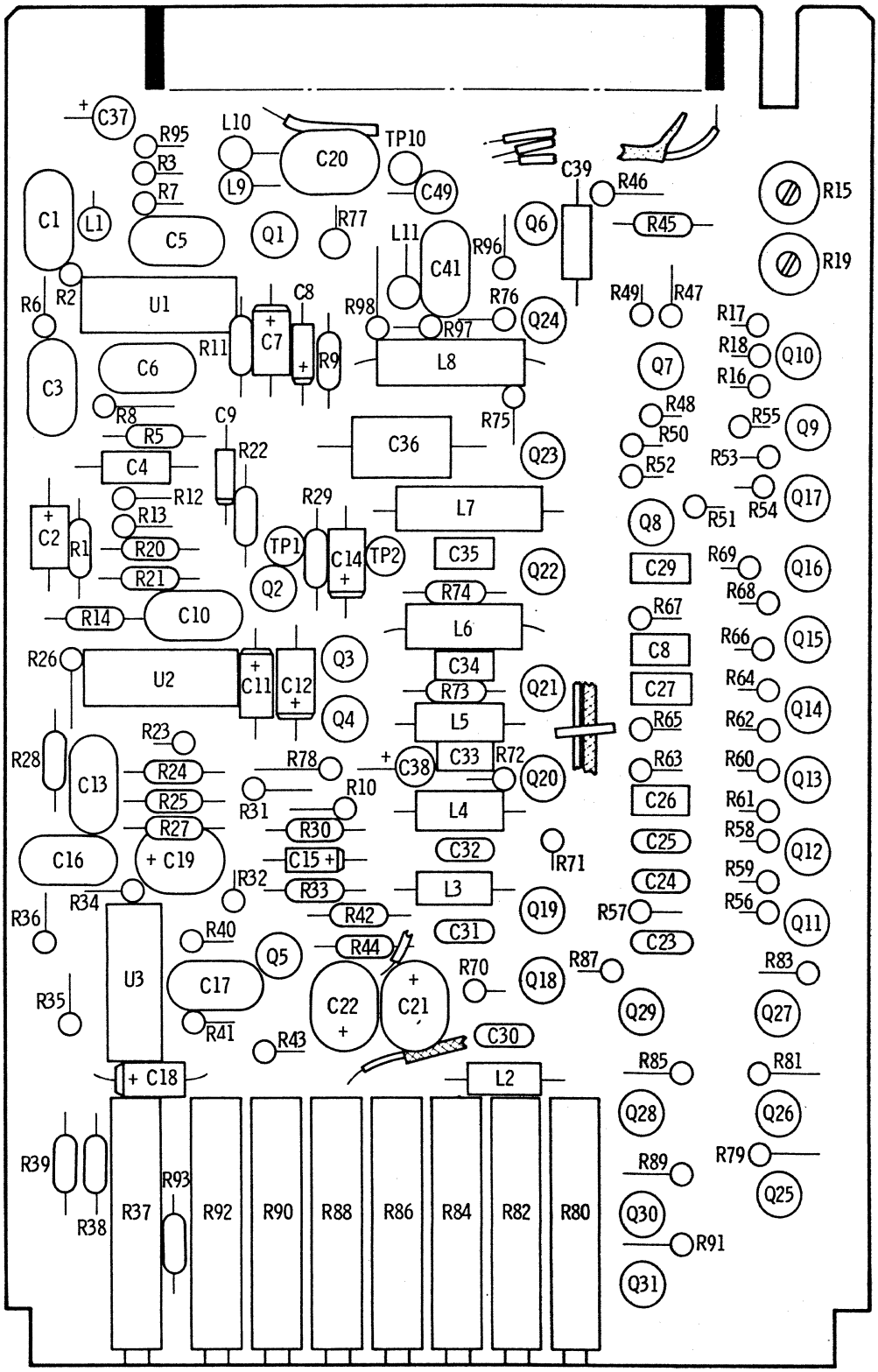
6-4. Manufacturer's code symbols used in the parts list are tabulated in the System manual with the manufacturer's name and address. All code symbols are in accordance with the Federal Supply Code for Manufacturers Handbooks H 4-1 and H 4-2.

6-5. ORDERING REPLACEMENT PARTS.

6-6. When ordering replacement parts refer to Section VI of the System manual for ordering instructions.

6-7. PARTS LOCATION ILLUSTRATIONS.

6-8. Figures 6-1 and 6-2 illustrate the location of components on the circuit cards.



D-379512-N (REF)

 Figure 6-1. 12-447C Direct Reproduce Amplifier Circuit Card

Table 6-1. Parts List for the 12-447C Direct Reproduce Amplifier (Sheet 1 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
1	479553	Direct Reproduce Amplifier	1		14028	
2	379512-0001	Circuit Card Assembly	1	6-1	14028	379512-0001
3	379512	Printed Circuit Board	1		14028	379512
4	126716-0174	Cable, rf, coaxial RG/U174	A/R		23172	QPL-17
5	70052-0212	Cord, nylon unwaxed tape (flat) natural color	A/R		00768	5ONOF17X-NATURAL
6	70094-0031	Cap, fixed, mica 150 pF ±5%, 500 Vdc	2	C1,41	93790	CD15F151J03-500WV
7	471920-0007	Cap, fixed, tantalum 68 uF ±20%, 25 Vdc	4	C19,20, C21,22	05397	T362-D-686-M-025-AS
8	471863-0004	Cap, fixed, tantalum 10.0 uF ±20%, 20 Vdc	9	C2,7,11, C12,14, C18,37, C38,40	31433	T320B106-M20AS
9	471921-0003	Cap, fixed, ceramic 1500 pF ±5%, 50 Vdc	1	C23	72982	CKO5BX152J
10	471921-0007	Cap, fixed, ceramic 3300 pF ±5%, 50 Vdc	1	C24	72982	CKO5BX332J
11	471921-0012	Cap, fixed, ceramic 6800 pF ±5%, 50 Vdc	1	C25	72982	CKO5BX682J
12	471921-0016	Cap, fixed, ceramic 0.015 uF ±5%, 50 Vdc	1	C26	72982	CKO6BX153J
13	471921-0021	Cap, fixed, ceramic 0.033 uF ±5%, 50 Vdc	2	C27,34	72982	CKO6BX333J
14	471921-0025	Cap, fixed, ceramic 0.068 uF ±5%, 50 Vdc	2	C28,35	72982	CKO6BX683J
15	471921-0028	Cap, fixed, ceramic 0.15 uF ±5%, 50 Vdc	1	C29	72982	CKO6BX154J

Table 6-1. Parts List for the 12-447C Direct Reproduce Amplifier (Sheet 2 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	70094-0051	Cap, fixed, mica 820 pF ±5%, 300 Vdc	7	C3,5,6, C10,13, C16,17	93790	CD15F821J03-300WV
2	471921-0005	Cap, fixed, ceramic 2200 pF ±5%, 50 Vdc	1	C30	72982	CK05BX222J
3	471921-0009	Cap, fixed, ceramic 4700 pF ±5%, 50 Vdc	1	C31	72982	CK05BX472J
4	471921-0013	Cap, fixed, ceramic 8200 pF ±5%, 50 Vdc	1	C32	72982	CK05BX822J
5	471921-0017	Cap, fixed, ceramic 0.018 uF ±5%, 50 Vdc	1	C33	72982	CK06BX183J
6	215095-0692	Cap, fixed, mylar 0.12 uF ±10%, 80 Vdc	1	C36	56289	192P1249R8
7	215095-0122	Cap, fixed, mylar 0.00068 uF ±10%, 200 Vdc	1	C39	56289	192P68192
8	215095-0542	Cap, fixed, mylar 0.0039 uF ±10%, 80 Vdc	1	C4	56289	192P3929R8
9	471863-0006	Cap, fixed, tantalum 2.2 uF ±20%, 25 Vdc	3	C8,9,15	31433	T320A225-M25AS
10	471788-0013	Coil, radio frequency 47 uH ±5%	2	L1,11	99800	1537-60
11	471788-0023	Coil, radio frequency 120 uH ±5%	1	L2	99800	1537-80
12	471788-0029	Coil, radio frequency 220 uH ±5%	1	L3	99800	1537-92
13	471788-0037	Coil, radio frequency 470 uH ±5%	1	L4	99800	2500-12
14	471788-0046	Coil, radio frequency 1000 uH ±5%	1	L5	99800	2500-28

Table 6-1. Parts List for the 12-447C Direct Reproduce Amplifier (Sheet 3 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	471788-0054	Coil, radio frequency 2200 uH ±5%	1	L6	99800	2500-44
2	471788-0060	Coil, radio frequency 3900 uH ±5%	1	L7	99800	2500-56
3	471788-0069	Coil, radio frequency 8200 uH ±5%	1	L8	99800	2500-72
4	472466-0046	Inductor, fixed, shielded 1000 uH ±5%	2	L9,10	76493	9250-105-5PCT
5	471931	Transistor, PNP hi freq switch	4	Q1,2,3,5	04713	2N3251
6	471472	Transistor, NPN 2N3947	27	Q4,6 thru Q31	04713	2N3947
7	471922-2022	Res, fixed, metal oxide 2000 ohm ±2%, 1/4 W	4	R1,22, R29,42	24546	C4-2K OHM-2 PCT
8	471922-1042	Res, fixed, metal oxide 100K ohm ±2%, 1/4 W	1	R10	24546	C4-100K OHM 2 PCT
9	471922-4722	Res, fixed, metal oxide 4.7K ohm ±2%, 1/4 W	1	R11	24546	C4-4.7K OHM 2 PCT
10	471922-3032	Res, fixed, metal oxide 30K ohm ±2%, 1/4 W	1	R12	24546	C4-30K OHM 2 PCT
11	471922-1532	Res, fixed, metal oxide 15K ohm ±2%, 1/4 W	1	R13	24546	C4-15K OHM 2 PCT
12	366427-0007	Res, var, cermet 1000 ohm ±20%, 1/2 W	1	R15	32997	3339P-1-102
13	471922-1132	Res, fixed, metal oxide 11K ohm ±2%, 1/4 W	10	R16,17, R18,79, R81,83, R85,87, R89,91	24546	C4-11K OHM 2 PCT

Table 6-1. Parts List for the 12-447C Direct Reproduce Amplifier (Sheet 4 of 6)

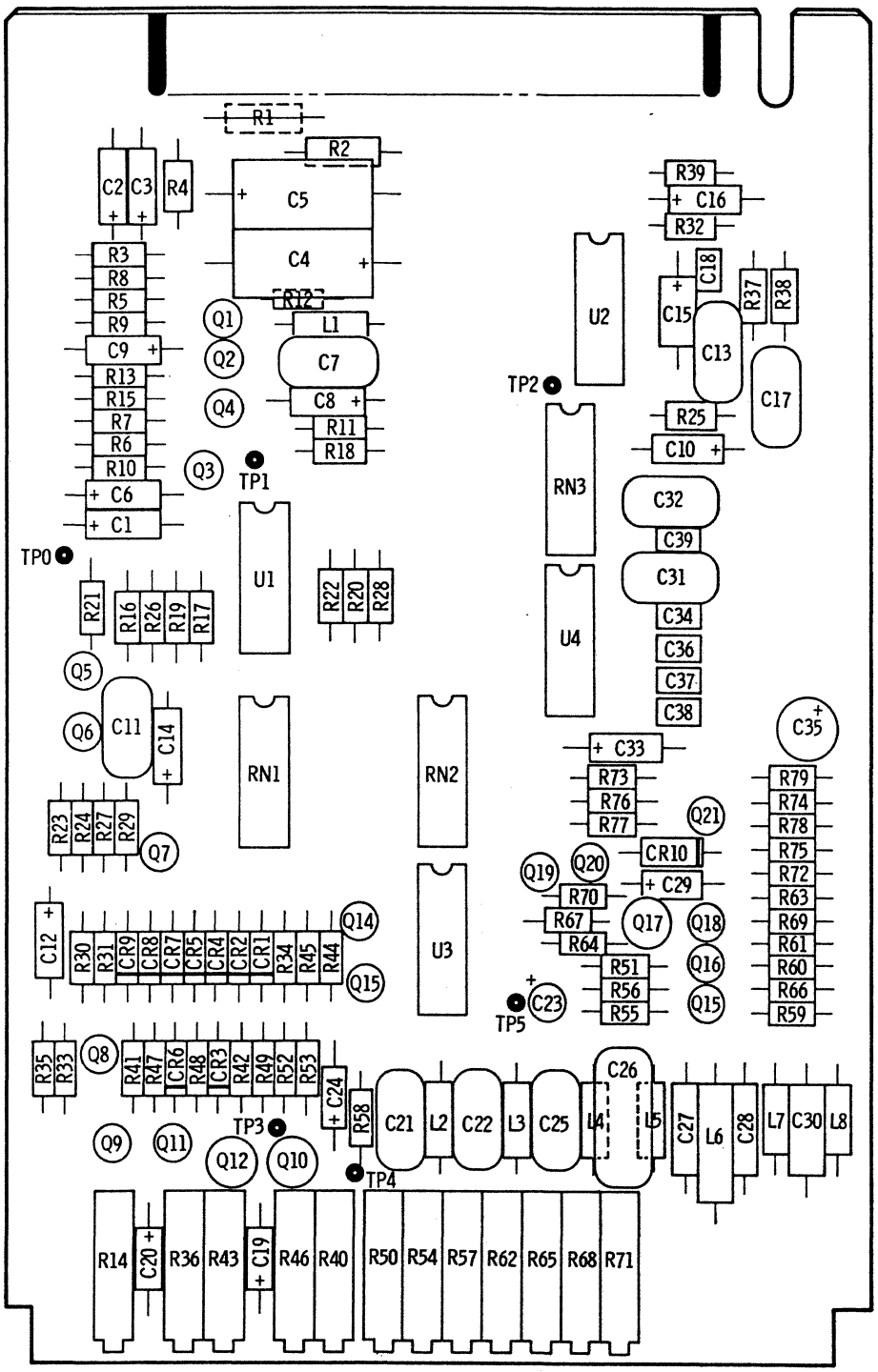
ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	366427-0004	Res, var, cermet 100 ohm, 1/2 W	1	R19	32997	3339P-1-101
2	471922-2032	Res, fixed, metal oxide 20K ohm ±2%, 1/4 W	4	R2,40, R78,97	24546	C4-20K OHM 2 PCT
3	471922-6812	Res, fixed, metal oxide 680 ohm ±2%, 1/4 W	1	R23	24546	C4-680 OHM 2 PCT
4	471922-2012	Res, fixed, metal oxide 200 ohm ±2%, 1/4 W	4	R3,14 R26,39	24546	C4-200 OHM 2 PCT
5	471922-1022	Res, fixed, metal oxide 1000 ohm ±2%, 1/4 W	12	R30,31, R38,57, R59,61, R63,65, R67,69, R95,96	24546	C4-1K OHM 2 PCT
6	471922-5122	Res, fixed, metal oxide 5100 ohm ±2%, 1/4 W	1	R33	24546	C4-5.1K OHM 2 PCT
7	471573-0920	Res, var, carbon 10000 ohm ±2%, 0.3 W	1	R37	01121	NP 103 M
8	471922-5112	Res, fixed, metal oxide 510 ohm ±2%, 1/4 W	2	R32,46	24546	C4-510 OHM 2 PCT
9	471922-5102	Res, fixed, metal oxide 51 ohm ±2%, 1/4 W	1	R44	24546	C4-51 OHM 2 PCT
10	471922-1842	Res, fixed, metal oxide 180K ohm ±2%, 1/4 W	7	R45,47, R49,50, R52,53, R55	24546	C4-180K OHM 2 PCT
11	471922-8212	Res, fixed, metal oxide 820 ohm ±2%, 1/4 W	1	R48	24546	C4-820 OHM 2 PCT

Table 6-1. Parts List for the 12-447C Direct Reproduce Amplifier (Sheet 5 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	70083-6245	Res, fixed, composition 0.62 meg ohm ±5%, 1/4 W	1	R5	01121	CB6245
2	471922-1522	Res, fixed, metal oxide 1500 ohm ±2%, 1/4 W	1	R51	24546	C4-1500 OHM 2 PCT
3	471922-3022	Res, fixed, metal oxide 3K ohm ±2%, 1/4 W	1	R54	24546	C4-3000 OHM 2 PCT
4	471922-7532	Res, fixed, metal oxide 75K ohm ±2%, 1/4 W	14	R56,58, R60,62, R64,66, R68,70, R71,72, R73,74, R75,76	24546	C4-75K OHM 2 PCT
5	471922-1032	Res, fixed, metal oxide 10K ohm ±2%, 1/4 W	8	R6,20,24, R25,27, R32,35, R98	24546	C4-10K OHM 2 PCT
6	471922-1012	Res, fixed, metal oxide 100 ohm ±2%, 1/4 W	8	R7,8,21, R28,34, R36,41, R93	24546	C4-100 OHM 2 PCT
7	471922-1222	Res, fixed, metal oxide 1.2K ohm ±2%, 1/4 W	1	R77	24546	C4-1200 OHM 2 PCT
8	471573-0520	Res, var, carbon 1000 ohm ±2%, 0.3 W	7	R80,82, R84,86, R88,90, R92	01121	NP 102 M
9	70083-1255	Res, fixed, composition 1.2 meg ohm ±5%, 1/4 W	1	R9	01121	CB1255
10	376087-0001	Connector, (vertical jack) brown	1	TP1	74970	105-858

Table 6-1. Parts List for the 12-447C Direct Reproduce Amplifier (Sheet 6 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	376087-0010	Connector, (vertical jack) black	1	TP10	74970	105-853
2	376087-0002	Connector, (vertical jack) red	1	TP2	74970	105-852
3	475244	Integrated Circuit	3	U1,2,3	04713	MC1303L
4	379656-0003	Panel Assembly, front	3		14028	379656-0003
5	379494-0002	Panel, front, amplifier module	1			
6	379380-0003	Label, front panel	1			
7	126732-0031	Connector, coaxial	1	J1	91836	KC-79-46
8	7127-0002	Terminal, lug, solder	1		71002	4
9	479639	Plate, connector mount	1			
10	379495	Plate, electrical shield	1			
11	126716-0174	Cable, rf, coaxial RG/U174	A/R		23172	QPL-17
12	19362	Insulation, sleeving, vinyl	A/R			
13	155527-0001	Ferrule, rf cable grounding violet	2		00779	323930



D-534880-0002 (REF)

Figure 6-2. 12-447C-1 Direct Reproduce Amplifier Circuit Card

Table 6-2. Parts List for the 12-447C-1 Direct Reproduce Amplifier (Sheet 1 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
1	534880-0002	Direct Reproduce Amplifier 1 MHz	1		14028	
2	534380-0002	Amplifier, direct reproduce	1	6-2	14028	
3	534380	Board, printed wiring amplifier	1		14028	
4	250995	Pad	1		08289	TP-503-044
5	7138-1005	Res, fixed, composition 10 ohm ±5%, 1/2 W	1	R2		RCR20G100JS
6	471922-1012	Res, fixed, metal oxide 100 ohm ±2%, 1/4 W	6	R10,17, R38,73, R74,76	24546	C4-100 OHM 2 PCT
7	471922-1022	Res, fixed, metal oxide 1K ohm ±2%, 1/4 W	5	R22,25, R27,44, R52	24546	C4-1K OHM 2 PCT
8	471922-1032	Res, fixed, metal oxide 10K ohm ±2%, 1/4 W	5	R31,41, R47,55, R75	24546	C4-10K OHM 2 PCT
9	471922-1042	Res, fixed, metal oxide 100K ohm ±2%, 1/4 W	1	R28	24546	C4-100K OHM 2 PCT
10	471922-1222	Res, fixed, metal oxide 1.2K ohm ±2%, 1/4 W	2	R11,64	24546	C4-1200 OHM 2 PCT
11	471922-1332	Res, fixed, metal oxide 13K ohm ±2%, 1/4 W	2	R6,69	24546	C4-13K OHM 2 PCT
12	471922-1502	Res, fixed, metal oxide 15 ohm ±2%, 1/4 W	2	R77,78	24546	C4-15 OHM 2 PCT
13	471922-1842	Res, fixed, metal oxide 180K ohm ±2%, 1/4 W	1	R37	24546	C4-180K OHM 2 PCT
14	471922-2012	Res, fixed, metal oxide 200 ohm ±2%, 1/4 W	1	R19	24546	C4-200 OHM 2 PCT

Table 6-2. Parts List for the 12-447C-1 Direct Reproduce Amplifier (Sheet 2 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-2		
1	471922-2022	Res, fixed, metal oxide 2K ohm ±2%, 1/4 W	2	R33,61	24546	C4-2K OHM 2 PCT
2	471922-2032	Res, fixed, metal oxide 20K ohm ±2%, 1/4 W	2	R3,5	24546	C4-20K OHM 2 PCT
3	471922-2222	Res, fixed, metal oxide 2.2K ohm ±2%, 1/4 W	1	R60	24546	C4-2200 OHM 2 PCT
4	471922-2422	Res, fixed, metal oxide 2.4K ohm ±2%, 1/4 W	2	R7,53	24546	C4-2400 OHM 2 PCT
5	471922-2722	Res, fixed, metal oxide 2.7K ohm ±2%, 1/4 W	2	R26,63	24546	C4-2700 OHM 2 PCT
6	471922-2742	Res, fixed, metal oxide 270K ohm ±2%, 1/4 W	2	R42,48	24546	C4-0.27 MEG OHM 2 PCT
7	471922-3012	Res, fixed, metal oxide 300 ohm ±2%, 1/4 W	8	R8,9,15, R29,49, R56,58, R70	24546	C4-300 OHM 2 PCT
8	471922-3022	Res, fixed, metal oxide 3K ohm ±2%, 1/4 W	4	R35,51, R66,72	24546	C4-3000 OHM 2 PCT
9	471922-3312	Res, fixed, metal oxide 330 ohm ±2%, 1/4 W	1	R12	24546	C4-330 OHM 2 PCT
10	471922-3332	Res, fixed, metal oxide 33K ohm ±2%, 1/4 W	1	R4	24546	C4-33K OHM 2 PCT
11	471922-3622	Res, fixed, metal oxide 3.6K ohm ±2%, 1/4 W	2	R23,24	24546	C4-3600 OHM 2 PCT
12	471922-3912	Res, fixed, metal oxide 390 ohm ±2%, 1/4 W	1	R20	24546	C4-390 OHM 2 PCT
13	471922-3922	Res, fixed, metal oxide 3.9K ohm ±2%, 1/4 W	1	R13	24546	C4-3900 OHM 2 PCT

Table 6-2. Parts List for the 12-447C-1 Direct Reproduce Amplifier (Sheet 3 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-2		
1	471922-5102	Res, fixed, metal oxide 51 ohm ±2%, 1/4 W	4	R16,32, R39,79	24546	C4-51 OHM 2 PCT
2	471922-5122	Res, fixed, metal oxide 5.1K ohm ±2%, 1/4 W	3	R18,30, R59	24546	C4-5.1K OHM 2 PCT
3	471922-5132	Res, fixed, metal oxide 51K ohm ±2%, 1/4 W	2	R34,45	24546	C4-51K OHM 2 PCT
4	471922-7522	Res, fixed, metal oxide 7.5K ohm ±2%, 1/4 W	1	R21	24546	C4-7.5K OHM 2 PCT
5	471922-9112	Res, fixed, metal oxide 910 ohm ±2%, 1/4 W	1	R67	24546	C4-910 OHM 2 PCT
6	378770-0007	Res, var, metal oxide 1K ohm ±10%, 3/4 W	2	R36,43	80294	3009P-1-102
7	378770-0009	Res, var, metal oxide 5K ohm ±10%, 3/4 W	3	R14,40, R46	80294	3009P-1-502
8	378770-0010	Res, var, metal oxide 10K ohm ±10%, 3/4 W	7	R50,54, R57,62, R65,68, R71	80294	3009P-1-103
9	70094-0024	Cap, fixed, mica 75 pF ±5%, 500 Vdc	1	C11	93790	CD15E750J03-500WV
10	70094-0025	Cap, fixed, mica 82 pF ±5%, 500 Vdc	1	C7	93790	CD15E820J03-500WV
11	70094-0034	Cap, fixed, mica 200 pF ±5%, 500 Vdc	1	C21	93790	CD15F201J03-500WV
12	70094-0036	Cap, fixed, mica 240 pF ±5%, 500 Vdc	1	C31	93790	CD15F241J03-500WV
13	70094-0038	Cap, fixed, mica 270 pF ±5%, 500 Vdc	1	C32	93790	CD15F271J03-500WV

Table 6-2. Parts List for the 12-447C-1 Direct Reproduce Amplifier (Sheet 4 of 6)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-2		
1	70094-0042	Cap, fixed, mica 390 pF ±5%, 500 Vdc	1	C22	93790	CD15F391J03-500WV
2	70094-0051	Cap, fixed, mica 820 pF ±5%, 300 Vdc	3	C13,17, C25	93790	CD15F821J03-300WV
3	70094-0067	Cap, fixed, mica 1.6K pF ±5%, 500 Vdc	1	C26	93790	CD19F162J03-500WV
4	202785-4933	Cap, fixed, mylar 0.003 uF ±5%, 400 Vdc	1	C27	14752	230B1E-302J
5	202785-5033	Cap, fixed, mylar 0.0062 uF ±5%, 400 Vdc	1	C28	14752	230B1E-622J
6	202785-5133	Cap, fixed, mylar 0.011 uF ±5%, 400 Vdc	1	C30	14752	230B1E-113J
7	471863-0004	Cap, fixed, tantalum 10.0 uF ±20%, 20 Vdc	10	C1,6,8, C9,10, C12,14, C15,16, C31	31433	T320B106-M20AS
8	471863-0007	Cap, fixed, tantalum 1.2 uF ±20%, 35 Vdc	6	C2,3,19, C20,24, C29	31433	T320A125-M35AS
9	471920-0003	Cap, fixed, tantalum 33 uF ±20%, 20 Vdc	1	C35	05397	T362-C-336-M-020-AS
10	471920-0010	Cap, fixed, tantalum 1 uF ±20%, 25 Vdc	1	C23	05397	T368-A-105-M-025-AS
11	471930-0004	Cap, fixed, electrolytic 25.0 uF -10 +75%, 25 V	2	C4,5	14655	NLW 25-25
12	479699-0025	Cap, ceramic 1K pF ±10%, 200 Vdc	1	C34	72982	CK05BX102K

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-2		
1	479699-0029	Cap, ceramic 2.2K pF ±10%, 100 Vdc	1	C36	72982	CK05BX222K
2	479699-0031	Cap, ceramic 3.3K pF ±10%, 100 Vdc	1	C18	72982	CK05BX332K
3	479699-0033	Cap, ceramic 4.7K pF ±10%, 100 Vdc	1	C37	72982	CK05BX472K
4	479699-0037	Cap, ceramic 0.01 uF ±10%, 100 Vdc	1	C38	72982	CK05BX103K
5	479699-0041	Cap, ceramic 22K pF ±10%, 50 Vdc	1	C39	72982	CK05BX223K
6	175936	Diode, signal 1N4148	9	CR1 thru CR9	03508	1N4148
7	800656	Diode	1	CR10	09214	MPD200
8	251361	Transistor	1	Q17		
9	252501-0004	Transistor, PNP type 2N3906-5	5	Q2,3,8, Q14,21	01295	2N3906-5
10	253082-0004	Transistor, NPN 2N3904	13	Q1,4,5, Q6,7,9, Q11,13, Q15,16, Q18,19, Q20	04713	2N3904
11	372412-0001	Transistor	2	Q10,12		
12	475224	Integrated Circuit	1	U2	04713	MC1303L
13	534415	Integrated Circuit type CA3081	3	U1,3,4	02735	CA3081
14	523655-1032	Component Network, dual-in-line, 10K ohm +250 -300%	2	RN1,3	73138	899-3-R-10.0K

Table 6-2. Parts List for the 12-447C-1 Direct Reproduce Amplifier (Sheet 6 of 6)

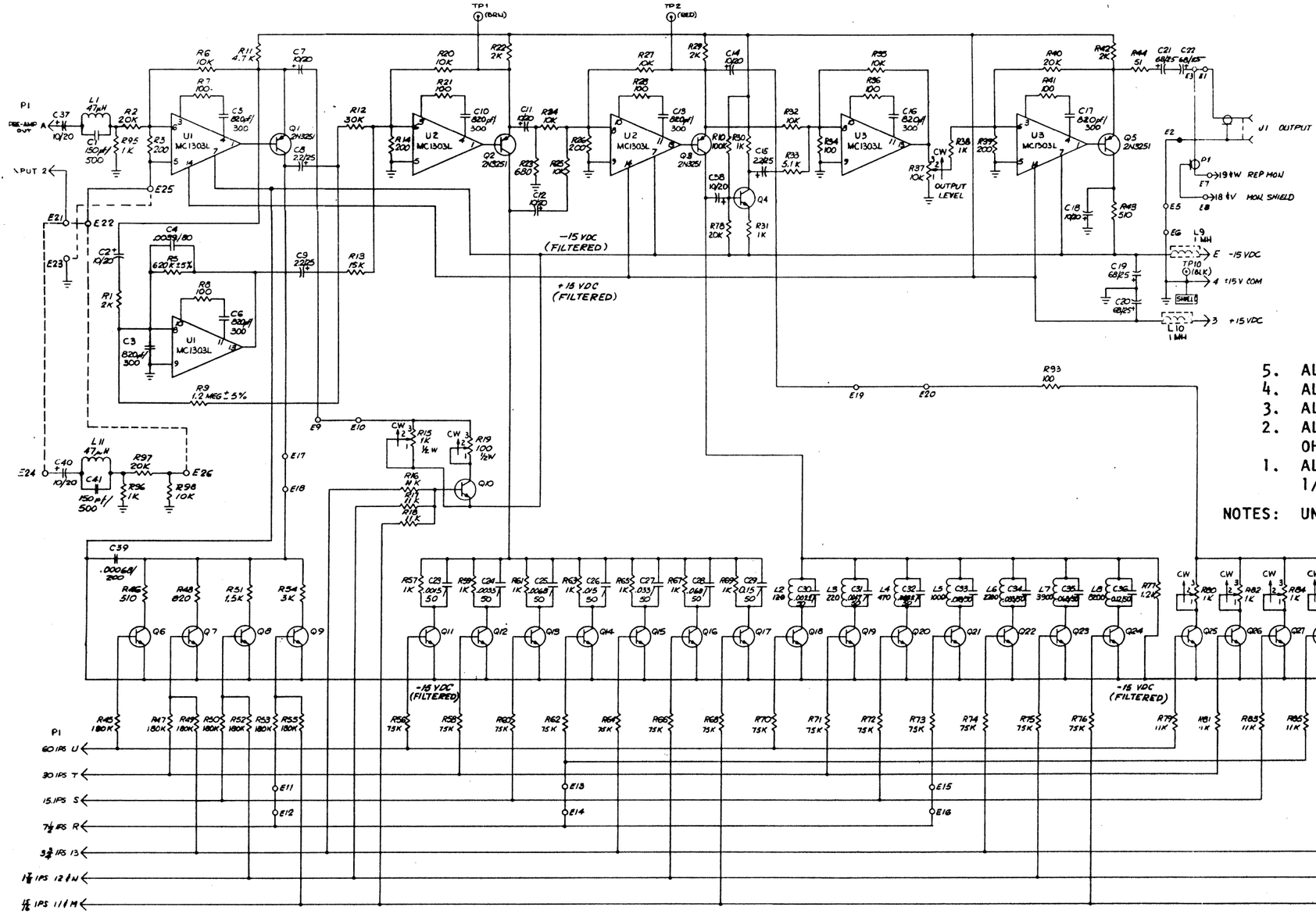
ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-2		
1	523655-6822	Component Network, dual-in-line, 6.8K ohm +250 -300%	1	RN2	73138	899-3-R-6.8K
2	471788-0053	Inductor, fixed 2K uH ± 5%	1	L6	99800	2500-42
3	800569-0029	Inductor, fixed	1	L1	24759	MR-22 ±10 PCT
4	800569-0037	Inductor, fixed	1	L2	24759	MR-100 ±10 PCT
5	800569-0041	Inductor, fixed	1	L3	24759	MR-220 ±10 PCT
6	800569-0045	Inductor, fixed	1	L4	24759	MR-470 ±10 PCT
7	800569-0049	Inductor, fixed	1	L5	24759	MR-1K ±10 PCT
8	800569-0056	Inductor, fixed	1	L7	24759	MR-3.9K ±10 PCT
9	800569-0060	Inductor, fixed	1	L8	24759	MR-8.2K ±10 PCT
10	379495	Plate, electrical, shield	1			
11	379494-0005	Panel, front, amplifier module	1			
12	479639	Plate, connector mount	1			
13	7127-0002	Terminal, lug, solder screw size 3/8	1		71002	4
14	126732-0031	Connector, coaxial panel, receptacle	1	J1	91836	KC-79-46
15	19362	Insulation, sleeving, vinyl	A/R		08547	
16	126716-0178	Cable, rf, coaxial RG-178B/U	A/R		23172	QPL-17
17	155527-0001	Ferrule, rf cable grounding violet	1		00779	323930

SECTION VII

SCHEMATICS

7-1. GENERAL.

7-2. This section contains the schematic diagrams (figures 7-1 and 7-2) for the 12-447C and 12-447C-1 Direct Reproduce Amplifiers.



5. ALL TRANSISTORS ARE 2N3947.
4. ALL CAPACITORS ARE IN µF/VDC.
3. ALL INDUCTOR VALUES ARE IN µH ±5%.
2. ALL VARIABLE RESISTOR VALUES ARE IN OHMS ±20%, 1/3 W.
1. ALL RESISTOR VALUES ARE IN OHMS ±2%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED.

E-379513(BASIC
(12-447 & 12-447A)
JUMPER E21 TO E22
JUMPER E23 TO E25

E-379513-0001
(12-447B)
JUMPER E21 TO E24
JUMPER E25 TO E26

E-379513-F (REF)

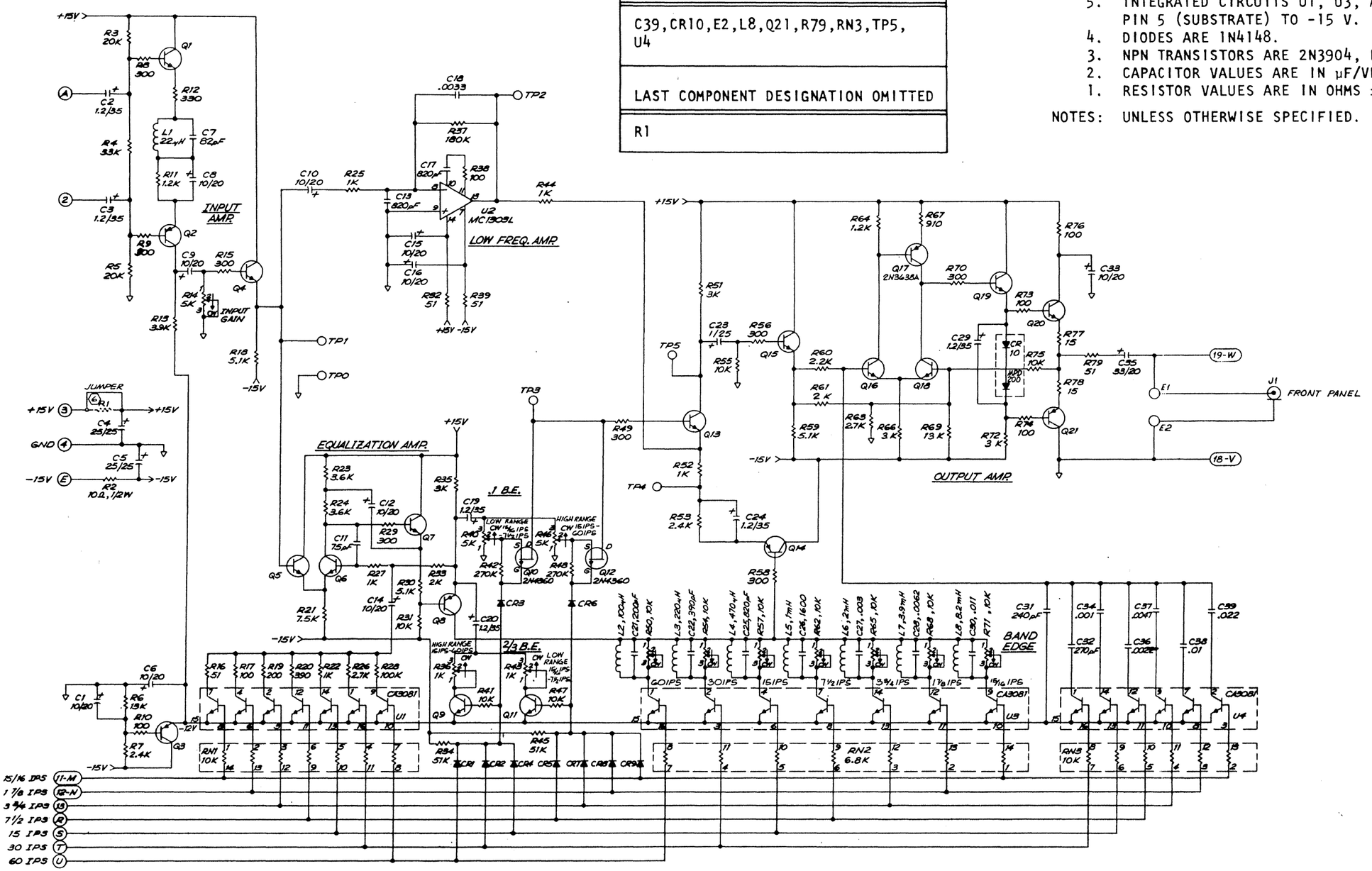
Figure 7-1. Schematic, 12-447C Direct Reproduce Amplifier

LAST COMPONENT DESIGNATION USED
C39,CR10,E2,L8,Q21,R79,RN3,TP5, U4
LAST COMPONENT DESIGNATION OMITTED
R1

(6) R1 IS NOT PART OF STANDARD ASSEMBLY FOR REF ONLY.

5. INTEGRATED CIRCUITS U1, U3, AND U4 (CA3081) HAVE PIN 5 (SUBSTRATE) TO -15 V.
4. DIODES ARE 1N4148.
3. NPN TRANSISTORS ARE 2N3904, PNP'S ARE 2N3906.
2. CAPACITOR VALUES ARE IN µF/VDC.
1. RESISTOR VALUES ARE IN OHMS ±2%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED.



E-533647-X3 (REF)

Figure 7-2. Schematic, 12-447C-1 Direct Reproduce Amplifier